ENERGY ENGINEERING ANALYSIS PROGRAM

FORT McCLELLAN, ALABAMA

ENERGY AUDIT OF NOBLE army HOSPITAL

FINAL REPORT

JUNE 1985

EXECUTIVE SUMMARY

Prepared for

MOBILE DISTRICT, CORPS OF ENGINEERS
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By

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ARMY CONTRACT NO. DACA01-83-C-0125

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EXECUTIVE SUMMARY

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1. INTRODUCTION

This is the executive summary of an Energy Engineering Analysis Program (EEAP) Study that was conducted at the Noble Army Hospital, Fort McClellan, Alabama by the firm of BENATECH, INC. Work was begun on the hospital energy audit during November, 1983. The facilities investigated in this EEAP Study include the main hospital (building 292) and certain support facilities (buildings 1789, 1929, 2290 and 3211). The study was a special EEAP Hospital Energy Audit and indentified 1 ECIP Project, 3 non-ECIP Projects and 13 Energy Conservation Measures (ECMs). A total of 32 ECMs were investigated and 15 were not recommended.

The Scope of Work (copy included in Appendix A, Volume II) for the hospital study required the performance of a comprehensive energy audit and analysis. If all of the 17 recommended projects and measures are implemented, a 2.3 percent reduction in basewide energy consumption would be realized.

A four volume report has been prepared that describes in detail the work accomplished during the study. Volume I provides all the descriptive narrative for the report. Volume II contains a copy of the Scope of Work and ECO calculations. Volume III contains field survey data, current criteria, and BLAST printout. Volume IV contains programming documentation that was prepared for submittal to obtain funding on each recommended project.

2. DESCRIPTION OF FACILITIES

This study consists of investigating the main hospital and four support facilities. A brief outline of key features for these buildings are provided in Table ES-T1 of the executive summary.

TABLE ES-T1
DESCRIPTION OF FACILITIES

	MAIN HOSPITAL BLDG 292	DISPENSARY BLDG 1789	DENTAL CLINIC BLDG 1929	DISPENSARY BLDG 2290	DISPENSARY BLDG 3211
AREA (FT2)	60000	3720	15750	8876	4125
NO. FLOOR	3	1	1	1	1
CONSTRUCTION WALLS: ROOF: FLOOR:	 CMU Built-up Basement	 CMU Built-up Basement	 CMU Built-up Basement	 CMU Built-up Basement	 CMU Built-up Basement
SERVICES OFFERED	Medical Surgical Obstetrical Pediatric Intensive Care Optical Dental X-ray	Medical X-ray Pharmacy Physical Therapy Laboratory	General Dentistry Oral Surgery Dental Lab	Medical X-ray Pharmacy Physical Therapy Laboratory	Medical X-ray Pharmacy Physical Therapy Laboratory
STAFFING	50-200 People	10-15 People	35-40 People	5-10 People	5-10 People
DAYS OF OPERATION	Sun - Saturday	M - F Saturday	M - F	M - F	M - F
HOURS OF OPERATION	24 hours a day	0630-1500 M-F 0700-0930 Sat	0715-1515	0700-1530	0700-1530

3. PROJECT APPROACH

This project was scoped to provide a detailed energy audit of the main hospital facility and a limited energy survey of the designated support facilities. Initial site surveys and investigations were planned and completed based upon the utilization of recommended ECO lists in conjunction with BENATECH's prepared energy checklists and survey data. Along with the energy audit efforts, data was gathered for metering plan recommendations. The BENATECH approach was formulated on a four step concept that paralleled the objectives set forth in the Contract Scope of Work. They are as follows:

1. Formulate and gather field data.
2. Consolidate and analyze field data.
   A. Prepare metering plan
   B. Prepare project recommendations
3. Prepare study report.
4. Prepare documentation and back up data for recommended projects.

4. PRESENT ENERGY CONSUMPTION

Each of the facilities, main hospital and support, use energy from three sources. These are electricity, steam and natural gas. Electricity is obtained from Alabama Power Company through the base electrical distribution system. Steam is provided for the facilities from at least two of the central boiler plants located on the base at Fort McClellan. These plants make steam from natural gas, oil or coal. Natural gas is provided to the facilities from a local commercial utility through the base distribution system.

Actual energy consumption for the hospital and support facilities have been, for the most part, unmetered and/or unrecorded in the past. Therefore, energy uses and consumption were developed using BLAST version 3.0. The results of these evaluations are provided in tables ES-T2 and ES-T3, figures ES-F1 and ES-F2 providing a graphic portrayal of the energy usages for the hospital and support facilities relative to the basewide and individual units. It can be readily seen that the main hospital combined with the medical support facilities utilized 77,253 MBTU's of the basewide energy usage of 1,203,267 MBTU's. This represents 6% of the basewide energy usage and was extracted from the EEAP study for Fort McClellan. The main hospital (building 292) uses the largest share of the energy consumed between the buildings evaluated in this study. Table ES-T3 and figure ES-F2 illustrate the energy consumption of the main hospital and support facilities in regards to each other.

Section 6 contains the recommendations and conclusions for this study. The energy savings realized by enacting the various recommended projects and the resulting energy consumption will be discussed.

TABLE NO. ES-T2

NOBLE ARMY HOSPITAL
FORT McCLELLAN, ALABAMA
*ANNUAL ENERGY CONSUMPTION

	ELECTRICITY			STEAM (Plant Uses Natural Gas)		
	MKWH	MBTU	DOLLARS	THERMS	MBTU	DOLLARS
Space/DHW Heating	0	0	0	158,650	15,865	$79,642
Cooling	0.940	10,899	$ 30,299	0	0	0
Other Elec.	3.408	39,529	$109,891	0	0	0
TOTALS	4.348	50,428	$141,190	158,650	15,865	$79,642

ENERGY UTILIZATION INDEX
Energy Utilization Index (EUI) = Total MBTU/TOTAL MSQ.FT.
= (50,428 + 15,865)/.16
= 66,293/.16
EUI = 414,331 BTU/SQ.FT./YR.

Where M = 1,000,000; 1 KWH = 11,600 BTU; 1 Therm = 100,000 BTU

Average Electricity MBTU Cost = ($3.30 + $2.25) ÷2 = $2.78/MBTU
(Average of Demand and Non-Demand Rates)

Average Natural Gas MBTU Cost = $5.02/MBTU

*Energy consumption figures are based on BLAST 3.0 simulations.

TABLE NO. ES-T3

COMBINED HOSPITAL AND SUPPORT FACILITIES
*ANNUAL ENERGY USAGE

DESCRIPTION	AREA (SQ.FT.)	CONSUMPTION BTU's x 10^6
Main Hospital, Building 292	160,000	66,293
Dispensary, Building 1789	3,720	1,256
Dental Clinic, Building 1929	15,750	5,316
Dispensary, Building 2290	8,876	2,996
Dispensary, Building 3211	4,125	1,392
TOTALS	192,471 Ft^2	77,253 MBTU

*Energy consumption figures are taken from the Energy Engineering Analysis Program study performed for Fort McClellan and BLAST 3.0 simulations.

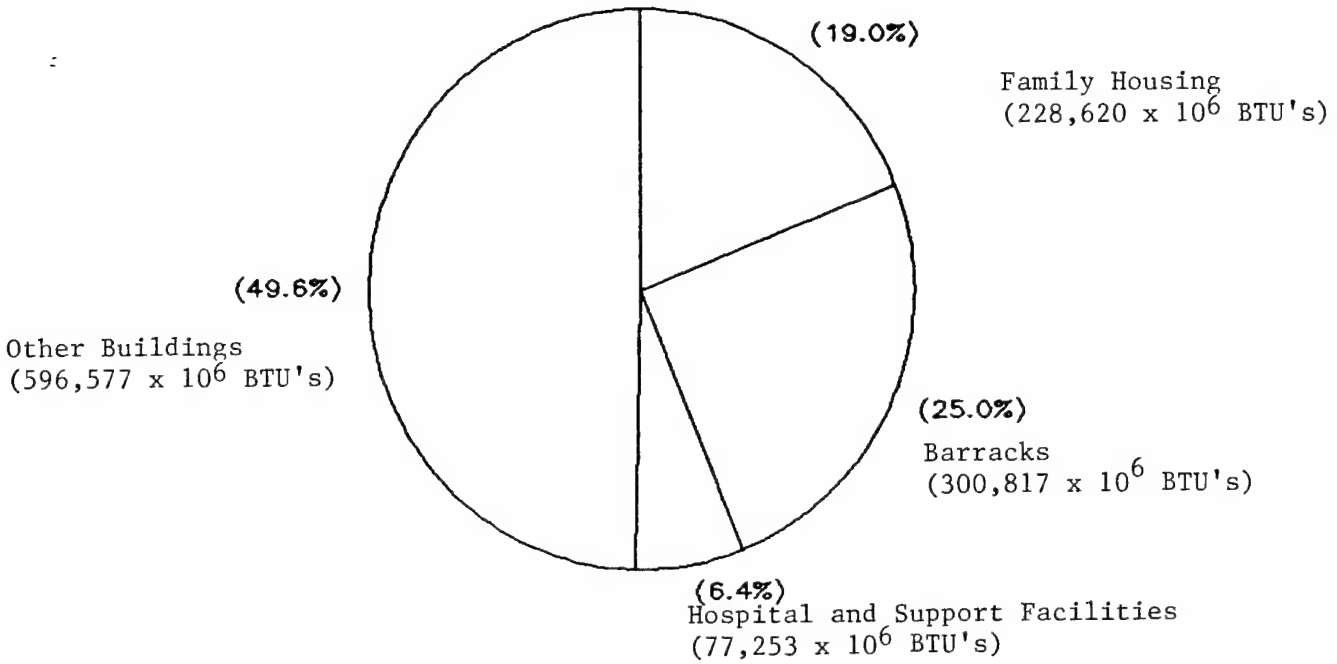

Figure ES-F1

*BASEWIDE ENERGY CONSUMPTION

*Figures developed from FY78 Energy EEAP Basewide Study completed by Black & Veatch.

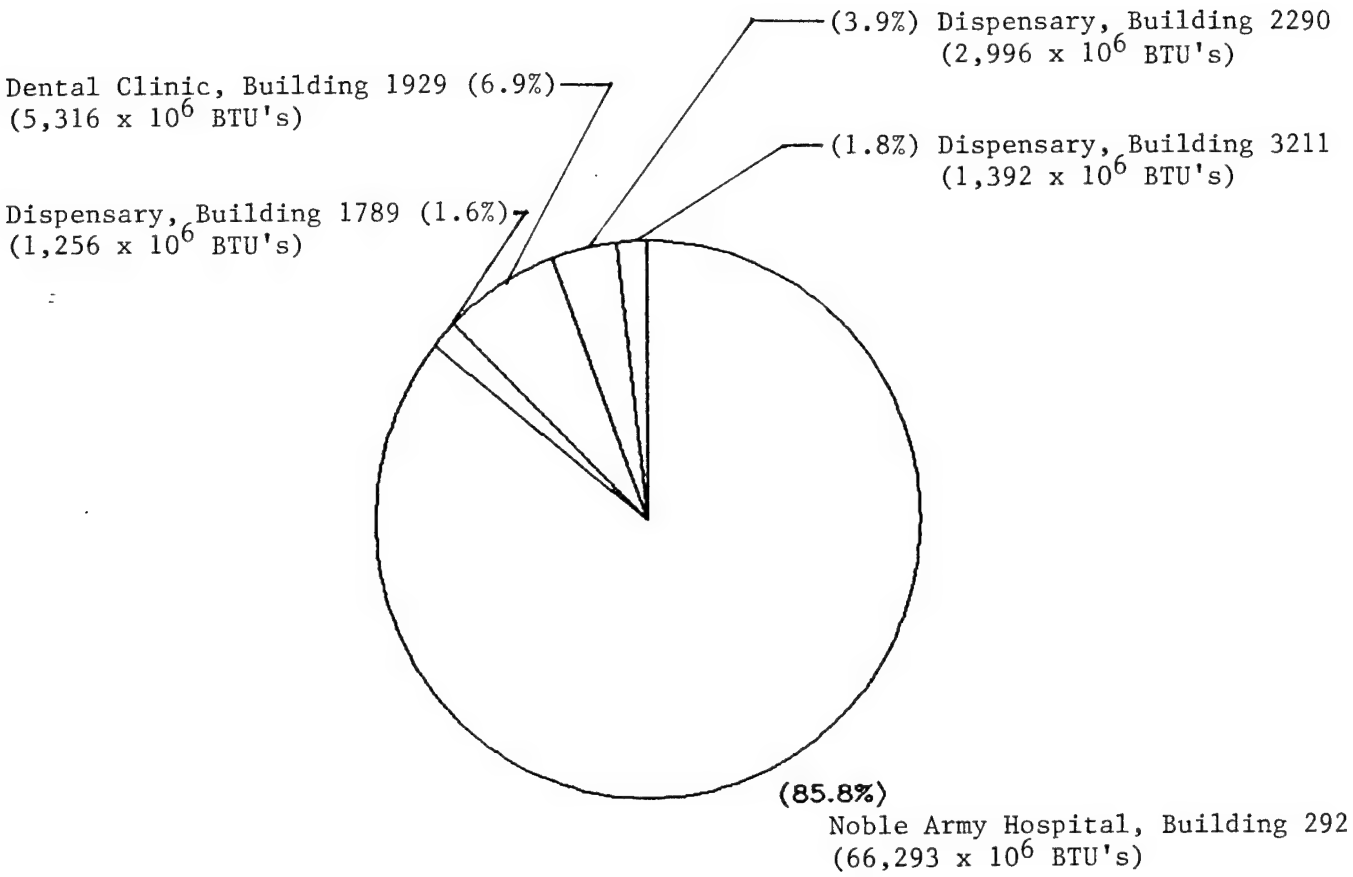

FIGURE ES-F2

MEDAC FACILITIES ENERGY CONSUMPTION

5. METERING PLAN

In accordance with the requirements specified in the Contract Scope of Work, a metering plan was developed for the main hospital facility (building 292). This plan was presented early in February 1984 and accepted for implementation with provisions that established certain activities for the base DEH and the A/E to complete in order for the plan to accomplish a goal of recording one full year of energy usage. The metering plan provides primary metering data for electrical, steam and natural gas supplied to the building with some limited submetering of chillers and pumping systems.

The metering data will be collected, analyzed and summarized for addition to the study report at the end of the one year term designated for the plan. A more detailed discussion on the metering plan is provided in the Narrative (Volume I, Section 8, Page 1).

6. SUMMARY AND CONCLUSIONS

This EEAP Study evaluates the main hospital and support facilities for possible energy conservation opportunities. The study includes on-site investigation, engineering analysis, and recommendations for project implementation.

The basic goal for the audit was to identify those energy conservation opportunities (ECOs) that might exist at the main hospital and designated support facilities. Investigations at the main facility were specified to be fully detailed while the support facilities investigations were limited to on-site observation.

Work began on the study with the ECOs provided in the Scope of Work being evaluated for possible implementation. Table ES-T4 is the potential ECOs listed in the Scope of Work. Table ES-T5 is a list of ECOs found not applicable or already implemented at the hospital. This list also includes ECOs evaluated but not recommended. Table ES-T5A is a list of ECOs recommended for implementation. Table ES-T5B is a listing of the buildings studied with their energy consumption before and after ECO implementation. A brief narrative for each ECO is provided in Volume I with the supporting data being provided in Volume II and project documentation being found in Volume IV.

The Noble Army Hospital EEAP Study has successfully identified projects that are highly recommended for implementation. If all the recommended projects and procedures are completed, a 41.0% savings in total hospital energy usage can be realized. These results are graphically shown in figures ES-F3, ES-F4 and ES-F5.

TABLE ES-T4

POTENTIAL ECO'S PROVIDED IN THE SCOPE OF WORK

Building envelope

1. Reduce infiltration by caulking and weather-stripping.
2. Install storm windows or double pane windows.
3. Install roof insulation.
4. Install loading dock seals.
5. Install vestibules on entrances.
6. Install blinds or curtains on windows.
7. Install solar shading on screening.

Electrical equipment

1. Shut off elevators whenever possible.
2. Shut off pneumatic tube system whenever possible.
3. Install capacitors or synchronous motors to increase power factor.
4. Use emergency generator to reduce peak demand.
5. Shed or cycle electrical loads to reduce peak demand.
6. Balance loads.
7. Reduce transformer losses by proper loading and balancing.
8. Convert to energy efficient motors.

Plumbing

1. Reduce domestic hot water temperature.
2. Repair and maintain hot water and steam piping insulation.
3. Install flow restrictors.
4. Install faucets which automatically shut off water flow.
5. Decentralize hot water heating.
6. Add piping insulation.

Kitchen

1. Shut off range hood exhaust whenever possible.
2. Install high-efficiency steam control valves.
3. Shut off equipment and appliances whenever possible.
4. Install makeup air supply for exhaust.
5. Install heat reclamation system for exhaust heat.
6. Turn off lights in coolers.
7. Install nighttime automatic steam cut off.

Heating, ventilating, and air conditioning

1. Shut off air handling units whenever possible.
2. Reduce outside air intake when air must be heated or cooled before use.
3. Reduce volume of air circulated through air handling units.
4. Shut off or reduce speed of room fan coils.
5. Shut off or reduce stairwell heating.
6. Shut off unneeded circulating pumps.
7. Reduce humidification to minimum requirements.
8. Reduce condenser water temperature.
9. Cycle fans and pumps.
10. Reduce pumping flow.
11. Reset thermostat higher during cooling and lower during heating.
12. Repair and maintain steam lines and steam traps.
13. Use damper controls to shut off air to unoccupied areas.
14. Reset hot and cold deck temperatures based on areas with greatest need.
15. Raise chilled water temperature.
16. Shed loads during peak electrical use periods.
17. Use outside air for free cooling whenever possible.
18. Reduce reheating of cooled air.
19. Recover heating or cooling with energy recovery units.
20. Reduce chilled water circulated during light cooling loads.
21. Install minimum sized motor to meet loads.
22. Replace hand valves with automatic controls.
23. Install variable air volume controls.
24. Common manifolding of chillers.
25. Insulate ducts and piping.
26. Eliminate simultaneous heating and cooling.
27. Install night setback controls.
28. Clean coils and tubes.
29. Maintain air filters.

Lighting

1. Shut off lights when not needed.
2. Reduce lighting levels.
3. Revise cleaning schedules.
4. Convert to energy efficient systems.
5. Addition of light switches.

Miscellaneous

1. Install incinerator and heat recovery system.
2. Install computerized energy monitoring and control system.

TABLE ES-T5

ECO's NOT APPLICABLE OR ALREADY IMPLEMENTED AT NOBLE ARMY HOSPITAL

Envelope	Install loading dock seals. No area has significant energy loss due to open loading dock.
Envelope	Install blinds or curtains on windows. Not applicable based on solar film analysis.
Electrical	Shutoff elevators whenever possible. Recommended as an O&M measure depending on hospital activity.
Electrical	Shutoff pneumatic tube system whenever possible There is no pneumatic tube system in the hospital.
Electrical	Install capacitors or synchronous motors to increase power factor. The power factor used by Alabama Power Co. is .95 which is not excessive.
Electrical	Use emergency generator to reduce peak demand. Not recommended due to load distribution on existing electrical system requiring significant changes as well as low kw ($5.25/KVA) charges.
Electrical	Shed or cycle electrical loads to reduce peak demand. Not recommended for hospital facility due to critical pressure relationships which must be maintained and equipment maintenance considerations.
Electrical	Balance loads. Field measurements indicate phase loads are within 5% of each other -- acceptable.
Electrical	Reduce transformer losses by proper loading and balancing. Field measurements indicate phase loads are within 5% of each other -- acceptable.
Plumbing	Reduce domestic hot water temperature. Domestic hot water temperatures are not excessive now.
Plumbing	Repair and maintain hot water and steam piping insulation. Insulation is in relatively good shape. Routine repairs recommended.
Plumbing	Install faucets which automatically shut off water flow. Not desired by hospital staff due to needs of staff and patients.
Plumbing	Decentralize hot water heating. Not recommended due to continuous use of DHW throughout hospital.
Plumbing	Add piping insulation. Insulation exists on DHW piping.
Kitchen	Shut off range hood exhaust whenever possible. Kitchen personnel do this as part of their daily routine.
Kitchen	Install high-efficiency steam control valves. There are no accessible steam control valves.
Kitchen	Shut off equipment and appliances whenever possible. Kitchen personnel do this as part of their daily routine.
Kitchen	Install makeup air for exhaust heat. There is no cooling in kitchen. Air removed is hot, humid hood air.
Kitchen	Install heat reclamation system for exhaust heat. Not applicable for existing climate and hospital systems.
Kitchen	Turn off lights in coolers. Coolers have automatic light cutoffs.
Kitchen	Install nighttime automatic steam cut off. Steam is not used except during kitchen operations.
Lighting	Reduce lighting levels. Levels are generally appropriate per 1981 IES standards.
Lighting	Revise cleaning schedule. No changes necessary.
Misc.	Install incinerator and heat recovery system. Insufficient waste for an incinerator.
HVAC	Shut off or reduce speed of room fan coils. There are no room fan coil units.
HVAC	Shut off or reduce stairwell heating. There is no stairwell heating.
HVAC	Reduce humidification to minimum requirements. Relative humidity levels are in the 20% - 40% range in the winter.
HVAC	Cycle fans and pumps. Not recommended for hospitals due to critical pressure relationships as well as equipment maintenance considerations
HVAC	Reduce pumping flow. Flow rates are not excessive.
HVAC	Repair and maintain steam lines and steam traps. Steam traps and lines are in relatively good condition.

TABLE ES-T5

(CONTINUED)

HVAC **Insulate ducts and piping.**
Ducts and piping are insulated.

HVAC **Eliminate simultaneous heating and cooling.**
The hot deck presently has an outside temperature reset that shuts off the system above a certain outdoor temperature.

HVAC **Shed loads during peak electrical use periods.**
Not recommended for hospital due to mission requirements, existing electrical distribution system, and low kw charges.

HVAC **Use outside air for free cooling whenever possible.**
Currently in use -- will be enhanced by EMCS.

HVAC **Reduce reheating of cooled air.**
Cooled air is not reheated.

HVAC **Recover heating or cooling with energy recovery units.**
Not practical because of decentralized exhaust system.

HVAC **Reduce chilled water circulated during light loads.**
Energy efficient motors are recommended instead.

HVAC **Install minimum sized motors to meet loads.**
Field measurements indicate motors are operating at 75% - 85% of design capacity.

HVAC **Replace hand valves with automatic controls.**
There are no hand valves.

HVAC **Common manifolding of chillers.**
Chillers are common manifolded.

HOSPITAL ECOs EVALUATED BUT NOT RECOMMENDED

SYSTEM	NO.	ECO	SIR
Envelope	7	Install Solar Film	0.77
HVAC	-	Rebalance AHU #4	0.52
Envelope	3	Install Roof Insul.	0.18
Envelope	5	Install Vestibule	0.05
HVAC	-	Rebalance AHU #6	n/a
HVAC	-	Rebalance AHU #7	n/a
HVAC	-	Rebalance AHU #8	n/a

SUPPORT FACILITIES ECOs EVALUATED BUT NOT RECOMMENDED

BLDG.	ECO	SIR
3211	Double Pane Window Retrofit	0.89
2290	Double Pane Window Retrofit	0.87
1789	Double Pane Window Retrofit	0.77
1929	Double Pane Window Retrofit	0.72
3211	Fluorescent Retrofit	0.69
1789	Fluorescent Retrofit	0.67
2290	Fluorescent Retrofit	0.62
1929	Fluorescent Retrofit	0.62

TABLE ES-T5A

ECOs RECOMMENDED FOR IMPLEMENTATION

BLDG.	ECO	RECOMMENDED FUNDING	SIR
292	EMCS	ECIP	1.06
292	Showerhead Retrofit	QRIP	40.94
292	Outside Air Reduction - AHU #6	QRIP	16.95
292	Lavatory Flow Restrictors	QRIP	8.87
1789	Install DHW Insulation	O&M	4.19
292	Rebalance AHU #5	O&M	3.67
292	Rebalance AHU #2	O&M	3.06
292	Rebalance AHU #3	O&M	2.17
292	Rebalance AHU #1	O&M	2.12
2290	Fluorescent Conversion	O&M	1.91
292	Motor Modernization	O&M	1.66
292	Double Pane Window Retrofit	O&M	1.54
3211	Install DHW Insulation	O&M	1.54
292	Automatic Chiller Tube Cleaner	O&M	1.51
292	Fluorescent Retrofit	O&M	1.40
1929	Fluorescent Conversion	O&M	1.11
1789	Fluorescent Conversion	O&M	1.08

TABLE ES-T5B: ENERGY USAGE AND SAVINGS FOR EACH BUILDING STUDIED

	BUILDINGS STUDIED				
	Noble Army Hospital	BLDG 1789	BLDG 1929	BLDG 2290	BLDG 3211
PRESENT CONSUMPTION FY 84 (MBTU)	66,293	1,256	5,316	2,996	1,392
PROJECTED ECO SAVINGS (MBTU)	27,272	30	98	15	1
PROJECTED ENERGY USAGE (MBTU)	39,021	1,226	5,218	2,981	1,391

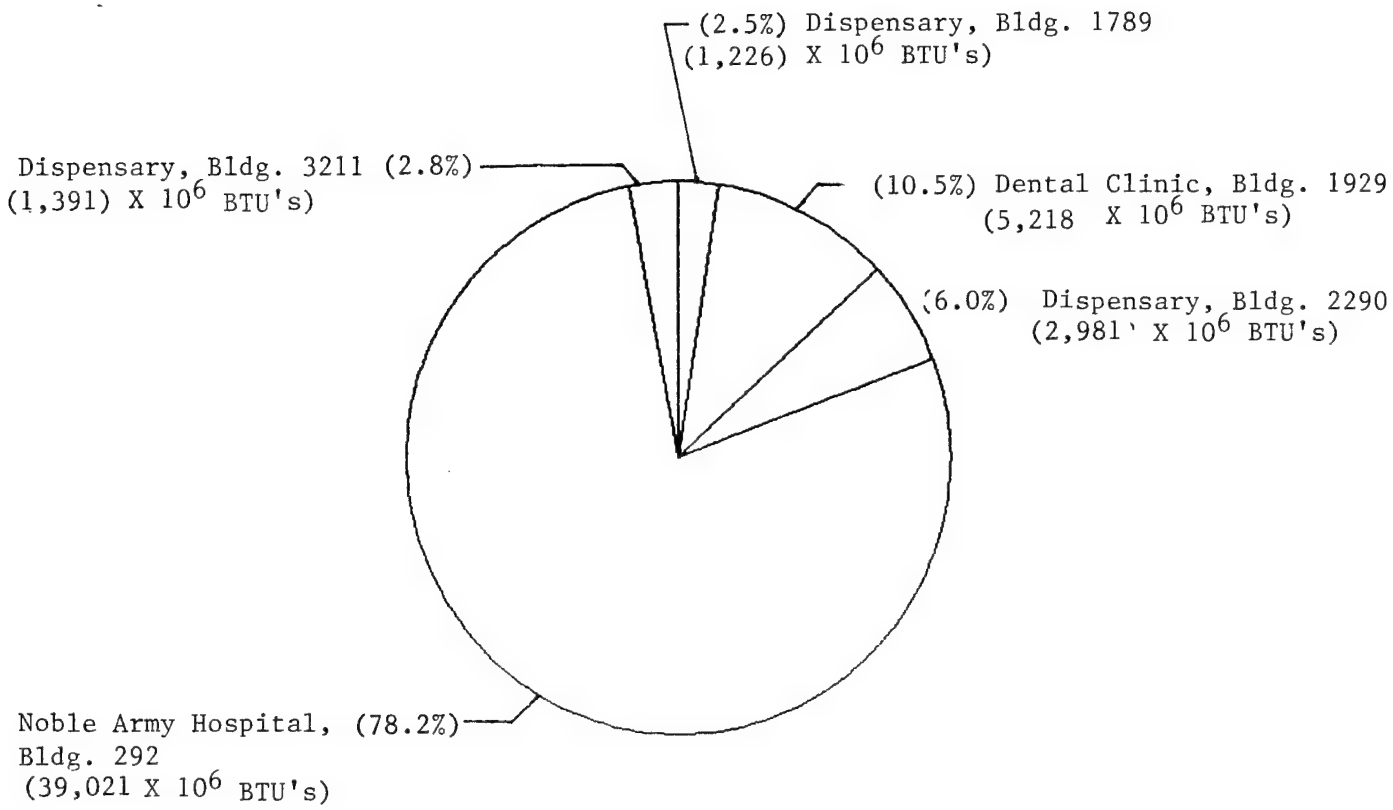

FIGURE ES-F3

MEDAC FACILITIES PROJECTED ENERGY

CONSUMPTION WITH ALL PROJECTS IMPLEMENTED

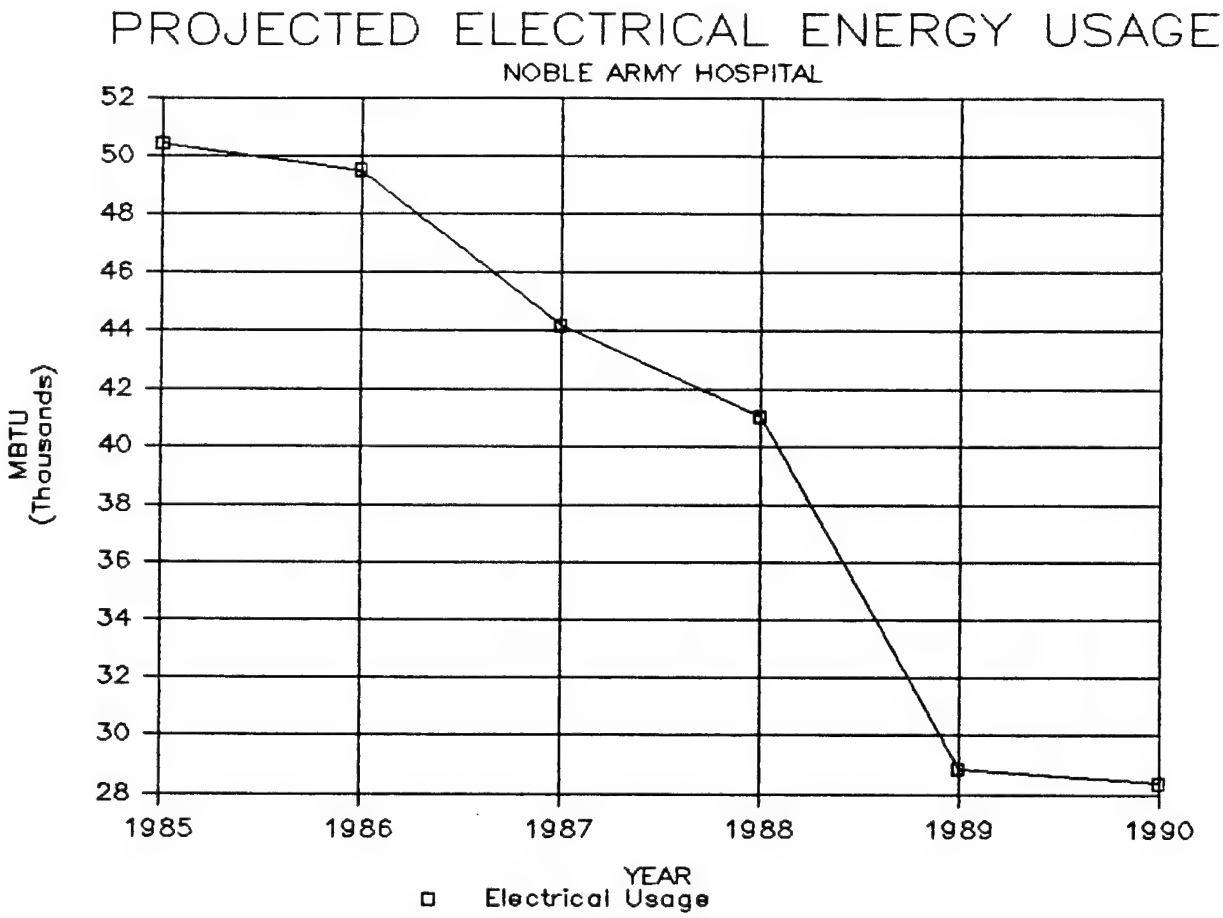
PROJECTED ELECTRICAL ENERGY USAGE
NOBLE ARMY HOSPITAL
MBTU (Thousands)
52
50
48
46
44
42
40
38
36
34
32
30
28
1985
1986
1987
1988
1989
1990
YEAR
Electrical Usage

FIGURE ES-F4

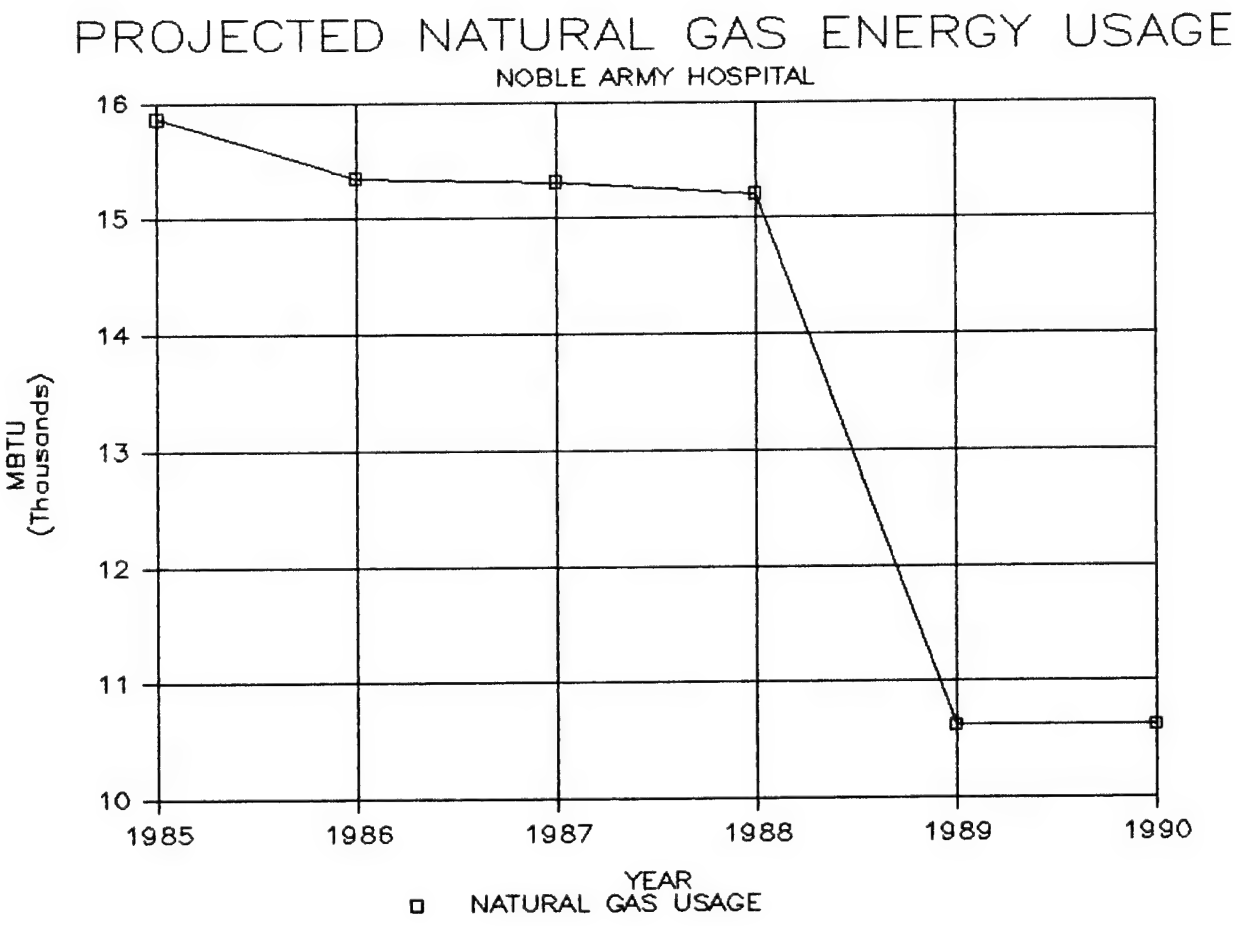
PROJECTED NATURAL GAS ENERGY USAGE
NOBLE ARMY HOSPITAL
MBTU
(Thousands)
16
15
14
13
12
11
10
1985
1986
1987
1988
1989
1990
YEAR
NATURAL GAS USAGE

FIGURE ES-F5

7. PROJECT SELECTIONS AND RECOMMENDATIONS

The following tables list the recommended projects and ECMs as they are grouped in the report. Table ES-T6 lists each component and their corresponding savings for the ECIP project for Noble Army Hospital. Table ES-T7 lists ECMs and their corresponding savings for Noble Army Hospital. Table ES-T8 lists ECMs and their corresponding savings for all support facilities.

Table ES-T9 contains the schedule for implementation of the ECIP project and eleven ECMs recommended for Noble Army Hospital.

TABLE ES.T6 HOSPITAL ECIP PROJECT

PROJECT CLASSIFICATION	PROJECT DESCRIPTION	ECM CONSTRUCTION COST ($)	ANNUAL ELECTRIC MBTU SAVINGS	ANNUAL NAT. GAS MBTU SAVINGS	TOTAL ANNUAL MBTU SAVINGS	FIRST YR DOLLAR SAVINGS	SIMPLE PAYBACK PERIOD (YEARS)	TOTAL NET DISC. DOLLAR SAVINGS	SIR
ECIP	EMCS -- Energy Monitoring and Control System	$533,061	12,192	4,582	16,774	$40,916	13.03	$560,883	1.06
	Individual ECMs Associated With the EMCS:								
	- On-Off Control, AHU-1,3,4	////////////	7,648.23	3,351.80	11,000.03	$34,036	////////////	////////////	//////
	- Hot/Cold Deck Reset-AHU-1,2,3,4	////////////	815.71	313.00	1,128.71	$3,430	////////////	////////////	//////
	- Optimum Start/Stop, AHU-1,3,4	////////////	223.73	0.00	223.73	$503	////////////	////////////	//////
	- Modifications to AHU-8	////////////	1,945.34	837.70	2,783.04	$8,535	////////////	////////////	//////
	- Chilled Water Temp. Reset	////////////	96.28	0.00	96.28	$217	////////////	////////////	//////
	- Condenser Water Temp. Reset	////////////	382.80	0.00	382.80	$861	////////////	////////////	//////
	- Hot Water Outside Air Reset	////////////	0.00	79.90	79.90	$401	////////////	////////////	//////
	- Shutoff Unneeded Lights	////////////	1,079.96	0.00	1,079.96	$2,435	////////////	////////////	//////
	NOTE: The individual ECM data shown above are incremental data for that particular ECM. Although each ECM could be controlled by an individual controller, the synergistic effect of EMCS control would not be achieved. Costs to implement individual control & still maintain savings are difficult to determine. EMCS control offers integrated control, more flexibility, easier setpoint adjustment, historical record capability, and expansion potential.								
	TOTALS FOR HOSPITAL	$533,061	12,192	4,582	16,774	$40,916	13.03	$560,883	1.06

TABLE ES-T7 HOSPITAL MINOR CONSTRUCTION QRIP AND O&M PROJECTS

PROJECT CLASSIFICATION	DESCRIPTION	ECM CONSTRUCTION COST ($)	ANNUAL ELECTRIC MBTU SAVINGS	ANNUAL NAT. GAS MBTU SAVINGS	TOTAL ANNUAL MBTU SAVINGS	FIRST YR DOLLAR SAVINGS	SIMPLE PAYBACK PERIOD (YEARS)	TOTAL NET DISC. DOLLAR SAVINGS	SIR
QRIP	Shower Flow Restrictors	$320	0	164	164	$823	0.39	$11,789	40.94
QRIP	Outside Air Reduction, AHU#6	$3,225	914	309	1223	$4,567	0.71	$56,839	16.95
QRIP	Faucet Flow Restrictors	$432	0	48	48	$241	1.79	$3,451	8.87
O&M	Rebalancing AHU#5	$9,503	931	-30	901	$2,922	3.25	$33,113	3.67
O&M	Rebalancing AHU#2	$33,293	2,525	15	2,540	$8,408	3.96	$96,735	3.06
O&M	Rebalancing AHU#3	$20,358	1,056	28	1,084	$3,625	5.62	$42,018	2.17
O&M	Rebalancing AHU#1	$16,023	810	22	832	$2,783	5.76	$32,268	2.12
O&M	Motor Modernization	$10,355	472	0	472	$1,556	6.65	$17,863	1.66
O&M	Double Pane Window	$7,344	71	104	175	$757	9.70	$10,176	1.54
O&M	Automatic Chiller Tube Cleaner	$27,800	1,004	0	1,004	$3,900	7.13	$43,692	1.51
O&M	Fluorescent Retrofit	$58,624	2,055	0	2,055	$6,782	8.64	$77,852	1.40
TOTALS FOR HOSPITAL		$187,277	9,838	660	10,498	$36,364	5.15	$425,796	/////

TABLE ES-T8 SUPPORT FACILITIES MINOR CONSTRUCTION QRIP AND O&M PROJECTS

BLDG	PROJECT CLASSIFICATION	PROJECT DESCRIPTION	ECM CONSTRUCTION COST ($)	ANNUAL ELECTRIC MBTU SAVINGS	ANNUAL NAT. GAS MBTU SAVINGS	TOTAL ANNUAL MBTU SAVINGS	FIRST YR DOLLAR SAVINGS	SIMPLE PAYBACK PERIOD (YEARS)	TOTAL NET DISC. DOLLAR SAVINGS	SIR
1789	O&M	Add Insulation to DHW Heater	$53	5	0	5	$17	3.12	$200	4.19
2290	O&M	Replacement of Incand. Lighting With Fluor.	270	15	0	15	$50	5.40	$488	1.91
3211	O&M	Add Insulation To DHW Htr.	$53	0	1	1	$5	10.60	$73	1.54
1929	O&M	Replacement of Incand. Lighting With Fluor.	$3,220	98	0	98	$323	9.97	$3,713	1.11
1789	O&M	Replacement of Incand. Lighting With Fluor.	$840	25	0	25	$83	10.12	$947	1.08
TOTALS FOR SUPPORT FACILITIES			$4,436	143	1	144	$478	9.28	$5,421	/////

SCHEDULE OF ECM IMPLEMENTATION
NOBLE ARMY HOSPITAL
TABLE ES-T9

Energy Use/Savings Category	MBTU Electrical	MBTU Natural Gas	MBTU TOTAL	New MBTU Electrical	New MBTU Nat.Gas	New Hospital TOTAL MBTU
Current Hospital Energy Use	50,428	15,865	66,293	50,428	15,865	66,293
Energy Saved in 1986 From ECMs Implemented in 1985:						
Shower Flow Restrictors	0	164	164			
Outside Air Reduction, AHU#6	914	309	1223			
Faucet Flow Restrictors	0	48	48			
NEW TOTALS	914	521	1,435	49,514	15,344	64,858
Energy Saved in 1987 From ECMs Implemented in 1986:						
Rebalancing AHUs #1,2,3,5	5,322	35	5,357			
NEW TOTALS	5,322	35	5,357	44,192	15,309	59,501
Energy Saved in 1988 From ECMs Implemented in 1987:						
Install Double Pane Windows	71	104	175			
Automatic Chiller Cleaner	1,004	0	1,004			
Fluorescent Retrofit	2,055	0	2,055			
NEW TOTALS	3,130	104	3,234	41,062	15,205	56,267
Energy Saved in 1989 From ECMs Implemented in 1988:						
ECIP PROJECT #1-EMCS	12192	4582	16774			
NEW TOTALS	12,192	4,582	16,774	28,870	10,623	39,493
Energy Saved in 1990 From ECMs Implemented in 1989:						
Convert to Energy Efficient Motors	472	0	472			
NEW TOTALS	472	0	472	28,398	10,623	39,021

Notes:

1. The above schedule is based on estimated dates with time allowances for design and project constructio The actual implementation of these ECMs may be sooner or later than presented here.

2. MBTU = 1,000,000 BTU.